Physics	Group-I	
Time: 1.45 Hours	(Subjective Type)	Paper-I
		Marks: 48

(Part-I)

2. Write short answers to any Five (5) questions: 10

(i) Define Plasma Physics and Nuclear Physics.

Ans **Plasma Physics:**

It is the study of production, properties of the ionic state of matter -- the fourth state of matter.

Nuclear Physics:

It deals with the properties and behaviour of nuclei and the particles within the nuclei.

(ii) What role SI units have played in the development of Science?

Ans With the developments in the field of science and technology, the need for a commonly acceptable system of units was seriously felt all over the world, particularly to exchange scientific and technical information. The eleventh General Conference on Weight and Measures held in Paris in 1960 adopted a world-wide system of measurements called International System of Units. The International System of Units is commonly referred as SI.

(iii) How many divisions are there on vernier scale?

Ans There are 10 divisions over it such that each of its divisions is 0.9 mm.

(iv) Convert 20 ms^{-1} speed in Km h^{-1}.

Ans Speed in km $h^{-1} = \frac{20 \times 60 \times 60}{1000}$

$= 72$ km h^{-1}

(v) How are vector quantities important to use in our daily life?

Ans In our daily life, the vector quantities are completely expressed or explained only when their directions are also considered.

(vi) Define uniform acceleration and give its any example.

Ans A body has uniform acceleration if it has equal changes in velocity in equal intervals of time, however, short the interval may be. The average acceleration of a body is a during time t. Let the time t is divided into many smaller intervals of time. If the rate of change of velocity during all these intervals remains constant then the acceleration a also remains constant. Such a body is said to possess uniform acceleration.

(vii) Define Newton's first law of motion.

Ans The Newton's first law of motion states that:

"A body continues its state of rest or of uniform motion in a straight line provided no net force acts on it."

(viii) Define centripetal force. Write its equation.

Ans Centripetal force is a force that keeps a body to move in a circle.

$$F_c = \frac{mv^2}{r}$$

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3. Write short answers to any Five (5) questions: 10

(i) Define centre of gravity.

Ans A point where the whole weight of the body appears to act vertically downward is called centre of gravity of a body.

(ii) What is meant by couple?

Ans When two equal and unlike parallel forces act at different points of a body, they constitute a couple.

(iii) Define second condition for equilibrium and write its formula.

Ans According to this, a body satisfies second condition for equilibrium when the resultant torque acting on it is zero.

Mathematically,

$$\Sigma\tau = 0$$

(iv) What is meant by moment arm?

Ans The perpendicular distance between the axis of rotation and the line of action of the force is called moment arm of the force.

(v) What is orbital speed of a low orbit satellite?

Ans The orbital speed of a low orbit satellite is 8 km s^{-1}.

(vi) What is meant by the force of gravitation?

Ans Newton concluded that there exists a force due to which everybody of the universe attracts every other body. He named this force the force of gravitation.

(vii) Define the unit of power "Watt".

Ans The power of a body is one watt, if it does work at the rate of 1 joule per second (1 Js^{-1}).

(viii) Differentiate between chemical and mechanical energy.

Ans Chemical energy is energy stored in the bonds of chemical compounds. It is present in food, fuels and in other substances. While the energy possessed by a body both due to its motion or position is called mechanical energy. Water running down a stream, wind, a moving car, a lifted hammer, a stretched bow, a catapult or a compressed spring, etc. possess mechanical energy.

4. Write short answers to any Five (5) questions:

(i) Define pressure and write its SI unit.

Ans The force acting normally per unit area on the surface of a body is called pressure.

Pressure is a scalar quantity. In SI units, the unit of pressure is Nm^{-2} also called pascal (Pa). Thus

$$1\ Nm^{-2} = 1\ Pa$$

(ii) State the characteristics of kinetic molecular model of matter.

Ans The kinetic molecular model of matter has some important characteristics. These are:

- Matter is made up of particles called molecules.
- The molecules remain in continuous motion.
- Molecules attract each other.

Kinetic molecular model is used to explain the three states of matter -- solid, liquid and gas.

(iii) Define stress.

Ans Stress is a physical quantity that expresses the internal forces that neighbouring particles of a continuous material exert on each other.

(iv) What is meant by latent heat of fusion?

Ans Heat energy required to change unit mass of a substance from solid to liquid state at its melting point without change in its temperature is called its latent heat of fusion.

(v) Write the difference between heat and temperature.

Ans Temperature of a body is the degree of hotness or coldness of the body.

Heat is the energy that is transferred from one body to the other in thermal contact with each other as a result of the difference of temperature between them.

(vi) Write any two applications of thermal expansion.

Ans Following are two applications of thermal expansion:

1. In thermometers, thermal expansion is used in temperature measurements.
2. Iron rims are fixed on wooden wheels of carts. Iron rims are heated. Thermal expansion allows them to slip over the wooden wheel.

(vii) Define convection.

Ans Transfer of heat by actual movement of molecules from hot place to a cold place is known as convection.

(viii) What measures do you suggest to conserve energy in houses?

Ans Following measures are suggested to conserve energy in houses:

1. Bulbs can be replaced by energy savers for light.
2. We can use such electric appliances that consume less energy.

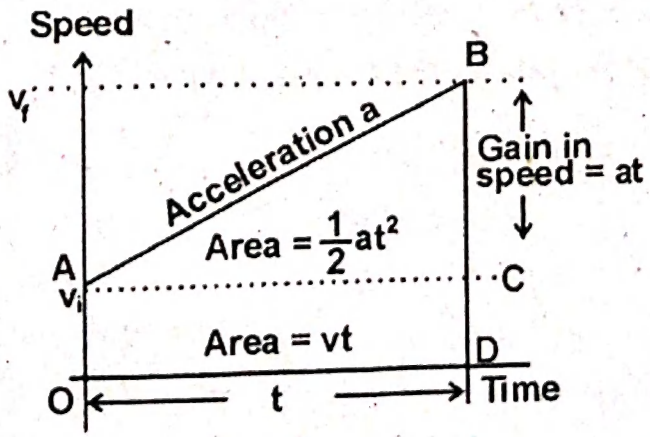
(Part-II)

Note: Attempt any Two (2) questions.

Q.5.(a) Prove with the help of graph: **(4)**

$$S = V_i t + \frac{1}{2} a t^2$$

Ans



In speed-time graph shown in figure, the total distance S travelled by the body is equal to the total area OABD under the graph. That is

Total distance S = area of (rectangle OACD + triangle ABC)

Area of rectangle OACD $= OA \times OD$

$= v_i \times t$

Area of the triangle ABC $= \frac{1}{2}(AC \times BC)$

$= \frac{1}{2} t \times at$

Since total area OABD = area of rectangle OACD + area of triangle ABC

Putting values in the above equation, we get.

$$S = v_i t + \frac{1}{2} t \times at$$

$$S = v_i t + \frac{1}{2} at^2$$

(b) A body of mass 5 kg is moving with a velocity of 10 ms^{-1}. Find the force required to stop it in 2 seconds.(5)

Ans

$m = 5\ kg$

$v_i = 10\ ms^{-1}$

$v_f = 0\ ms^{-1}$

$t = 2\ s$

$F = ?$

$P_i = 5\ kg \times 10\ ms^{-1}$

$= 50\ Ns$

$P_f = 5\ kg \times 0\ ms^{-1}$

$= 0\ Ns$

since $F = \frac{P_f - P_i}{t}$

$$= \frac{50\ \text{Ns} - 0\ \text{Ns}}{2\ \text{s}}$$

$$= 25\ \text{N}$$

Thus 25 N force is required to stop the body.

Q.6.(a) Find the centre of gravity of an irregular shaped thin lamina with the help of an experiment. (4)

Ans Experiment:

Take an irregular piece of cardboard. Make holes A, B and C as shown in figure near its edge. Fix a nail on a wall.

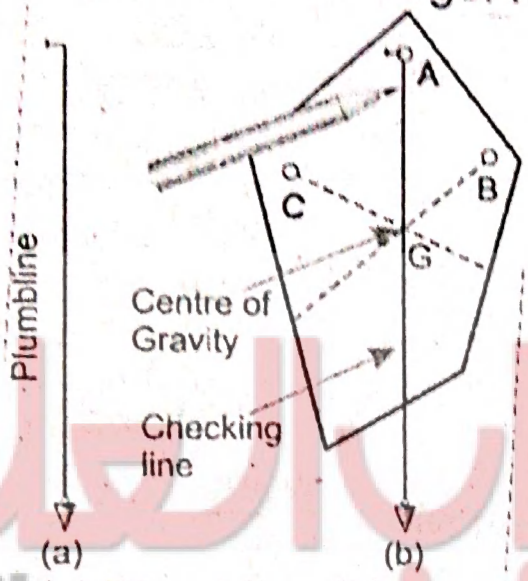


Fig. (a) Plumbline (b) Locating the centre of gravity of a piece of cardboard by using plumbline.

Support the cardboard on the nail through one of the holes (let it be A), so that the cardboard can swing freely about A. The cardboard will come to rest with its centre of gravity just vertically below the nail. Vertical line from A can be located using a plumbline hung from the nail. Mark the line on the cardboard behind the plumbline. Repeat it by supporting the cardboard from hole B. The line from B will intersect at a point G. Similarly, draw another line from the hole C. Note that this line also passes through G. It will be found that all the vertical lines from holes A, B and C have a common point G. This common point G is the centre of gravity of the cardboard.

(b) A man M_1 takes 80 s in lifting a load [illegible] a height of 10 m. While another man M_2 takes 10 s [illegible] doing the same job. Find the power of each. (5)

Ans

$F = 200\ N$

$S = 10\ m$

Time taken by man $M_1 = t_1 = 80\ s$

Time taken by man $M_2 = t_2 = 10\ s$

As work done $= F \times S$

$= 200 \times 10$

$= 2000\ J$

Power of man $M_1 = \frac{work}{t_1}$

$= \frac{2000}{80} = 25\ J\ s^{-1}$

$= 25$ watts

Power of man $M_2 = \frac{work}{t_2}$

$= \frac{2000\ J}{10\ s} = 200\ J\ s^{-1}$

$= 200$ watts

Q.7.(a) What is meant by evaporation? On wha factors the evaporation of liquid depends? (4)

Ans **Evaporation:**

Evaporation is the changing of a liquid into vapour (gaseous state) from the surface of the liquid without heating it.

Factors of the Evaporation of liquid:

Temperature:

Why wet clothes dry up more quickly in summer than in winter? At higher temperature, more molecules of a liquid are moving with high velocities. Thus, more molecules escape from its surface. Thus, evaporation is faster at high temperature than at low temperature.

Surface Area:

Why water evaporates faster when spread over large area? Larger is the surface area of a liquid, greater number of molecules has the chance to escape from its surface.

Wind:

Wind blowing over the surface of a liquid sweeps away the liquid molecules that have just escaped out. This increases the chance for more liquid molecules to escape out.

Nature of the Liquid:

Does spirit and water evaporate at the same rate? Liquids differ in the rate at which they evaporate.

(b) The weight of a metal spoon in air is 0.48 N. Its weight in water is 0.42 N. Find its density. (5)

Ans Weight of the spoon $w_1 = 0.48\ N$

Weight of spoon in water $w_2 = 0.42\ N$

Density of water $\rho = 1000\ kg\ m^{-3}$

Density of spoon $D = ?$

Using equation 7.8,

$$D = \frac{w_1}{w_1 - w_2} \times \rho$$

$$= \frac{0.48\ N}{0.48\ N - 0.42\ N} \times 1000\ kg\ m^{-3}$$

$$= 8000\ kg\ m^{-3}$$

Thus, density of the material of the spoon is 8000 kgm^{-3}.